

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
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PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

24 AUG 2004

Applicant's or agent's file reference

F174822

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US04/00615

International filing date (day/month/year)

12 January 2004 (12.01.2004)

Priority date (day/month/year)

13 January 2003 (13.01.2003)

International Patent Classification (IPC) or both national classification and IPC

IPC(7): B01D 53/02 and US Cl.: 95/134, 901; 502/417, 421; 110/203; 210/660; 502.1

Applicant

ENGINEERING PERFORMANCE SOLUTIONS, LLC

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US

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8-4-04

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US04/00615

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

**WRITTEN OPINION OF THE
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Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims <u>3-7, 20-25</u>	YES
	Claims <u>1, 2, 8-19, 26-28</u>	NO
Inventive step (IS)	Claims <u>3-7, 22</u>	YES
	Claims <u>1, 2, 8-21, 23-28</u>	NO
Industrial applicability (IA)	Claims <u>1-28</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and explanations:

Claims 1, 8, 12-19 and 26-28 lack novelty under PCT Article 33(2) as being anticipated by either one of US 3,803,033 A (SUTHERLAND) or US 4,201,831 A (SLUSARCZUK et al). Either one of US '033 or US '831 teach a method of removing a contaminant from a fluid stream comprising contacting the stream with a composite of activated carbon powder and magnetite, removing the magnetized activated carbon having a contaminant adsorbed on it, and reusing the sorbent material in the process. The magnetite material is present in less than a 1:3 ratio with respect to the carbon material. (See US '033, col. 2, lines 48-54, col. 3, lines 34-42, col. 4, lines 10-17, col. 5, line 10 to col. 6, line 4; US '831, col. 1, lines 8-11, col. 1, line 56 to col. 2, line 2, col. 2, line 39 to col. 3, line 3, col. 4, lines 31-68).

Claims 1, 2, 8-12, 17 and 18 lack novelty under PCT Article 33(2) as being anticipated by US 2002/0124725 A1 (CHANG et al). US '725 teaches a process for removing mercury from a flue gas stream comprising injecting particulate activated carbon coated on magnetic iron particles into the stream, adsorbing mercury onto the particles, removing the particles from the fluid stream, and recycling the particles back into contact with the stream. (See abstract, paragraphs 4, 16, 17).

Claims 14-16, 20, 21 and 23-28 lack an inventive step under PCT Article 33(3) as being obvious over US '725 in view of US 6,258,334 B1 (GADKAREE et al). US '725 discloses all of the limitations of the claims as discussed above except that the particles have less than a 1:3 ratio of magnetic material to carbon material and a photocatalyst such as tin oxide in an amount of less than about 5% by weight of the total material and catalyst. US '334 discloses a catalytic activated carbon material for removing mercury emissions from a coal-fired power plant, comprising an activated carbon sorbent having a co-catalyst such as tin oxide coated on it in an amount of less than 1% by weight of the sorbent (see col. 1, lines 22-38, col. 2, lines 32-40, col. 3, line 58 to col. 4, line 38). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the sorbent of US '725 by including a tin oxide coating in order to provide enhanced activity to the activated carbon for adsorbing mercury.

Claims 3-7 and 22 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest a process for removing a contaminant from a fluid stream comprising contacting the stream with a composite of activated carbon, a magnetic material, and a photocatalyst to adsorb the contaminant, exposing the photocatalyst to excitation energy to provide hydroxyl radicals on the surfaces, and removing the carbon from the fluid stream, or a composite comprising activated carbon, a magnetic material and a tin dioxide photocatalyst.

Claims 1-28 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

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Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

The description is objected to as containing the following defect(s) under PCT Rule 66.2(a)(iii) in the form or contents thereof: A period should be inserted after line 20 of page 3.

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International application No.

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claim 1 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 1 is indefinite for the following reason(s): Claim 1 broadly recites removing a contaminant from a fluid stream but then recites removing carbon having "the mercury" adsorbed thereon.